ICU
MANAGEMENT & PRACTICE

ARDS Subphenotypes Using Machine Learning

An observational, multicohort, retrospective study was conducted to validate two machine-learning clinical classifier models for assigning acute respiratory distress syndrome (ARDS) subphenotypes. Two ARDS subphenotypes with distinct biological and clinical features and differential treatment responses have been identified in seven individual cohorts. In addition, clinical classifier models to facilitate bedside identification of ARDS subphenotypes have also been described in four randomised controlled trials.

This review aimed to assess the performance of these models through the validation of two observational cohorts of patients with ARDS. These included the Early Assessment of Renal and Lung Injury (EARLI; n=335) and Validating Acute Lung Injury Markers for Diagnosis (VALID; n=452), with LCA-derived subphenotypes.

Vital signs and laboratory variables were included in the primary model, while the secondary model comprised the predictors in the primary model and also considered ventilatory variables and demographics. The performance of the models was assessed by calculating the area under the receiver operating characteristic curve (AUC) and calibration plots. Also, subphenotypes were assigned a probability cutoff value of 0.5 to determine sensitivity, specificity and accuracy.

Investigators assessed the performance of the primary model using data extracted from an electronic health record, while the secondary model was assessed through the application of a custom classifier model. The prognostic value of the subphenotypes was evaluated, and their interaction with the positive end-expiratory pressure (PEEP) strategy was tested. The dependent variable was 90-day mortality.

Findings of the analysis show that the primary clinical classifier model had an AUC of 0.92 in EARLI and 0.88 in VALID. The performance of the primary model was similar when using EHR-derived predictors compared with manually curated predictors. In the secondary model, 90-day mortality was higher in patients assigned the hyperinflammatory subphenotype compared to those with hypoinflammatory phenotype. Treatment interaction with PEEP strategy and ARDS subphenotype was observed and lower 90-day mortality found in the high PEEP group with the hyperinflammatory subphenotype versus low PEEP group and hypoinflammatory subphenotype.

These observations suggest that classifier models using clinical variables alone can assign ARDS subphenotypes accurately, provide valuable prognostic information, and inform management strategies for personalised treatment.

Source: The Lancet Respiratory Medicine

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